WHAT IS CLAIMED IS:

1. An organic photosensitive optoelectronic device comprising:

a substrate having a first major surface and a second major surface;

at least two transparent electrode layers in superposed relationship upon said first major surface of said substrate; and

at least one photoconductive organic layer disposed between said at least two transparent electrode layers.

2. The device of claim 1 wherein the thickness of said at least one photoconductive organic layer is selected to maximize the external quantum efficiency of said device.

3. The device of claim 1 wherein the thickness of said at least one photoconductive organic layer is selected to maximize the total current output of said device.

4. The device of claim 1 wherein the thickness of said at least one photoconductive organic layer is selected to maximize the fill factor of said device.

5. The device of claim 2 wherein at least one of said transparent electrode layers comprises a non-metallic conductive layer.

6. The device of claim 2 wherein at least one of said transparent electrode layers comprises a metallic conductive layer.

7. The device of claim 5 wherein said non-metallic conductive layer is a conductive oxide.

8. The device of claim 7 wherein said conductive oxide is selected from the group consisting of indium tin oxide, tin oxide, gallium indium oxide, zinc oxide and zinc indium oxide.

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30. The device of claim 29 wherein said inner pair of said ~~four photoconductive~~ organic layers ~~is~~ consist of a pair of photoconductive ~~organic~~ ~~dyes~~ layers selected to form a photovoltaic heterojunction ~~and~~ selected to have spectral sensitivity in a specified region of the electromagnetic spectrum.

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31. The device of claim 30 wherein said pair of photoconductive organic ~~dyes~~ layers comprises aluminum *tris*(8-hydroxyquinoline) and 4,4'-bis[N-(1-napthyl)-N-phenyl-~~amino~~]biphenyl.

32. The device of claim 30 wherein at least one of said outer pair of said four photoconductive organic layers comprises an organic molecular crystal material.

33. The device of claim 30 wherein at least one of said outer pair of said four photoconductive organic layers comprises a polymeric material.

34. The device of claim 30 wherein at least one of said outer pair of said four photoconductive organic layers comprises a material selected from the group consisting of phthalocyanine compounds, perylene compounds, polyacene compounds, and porphyrin compounds.

2 ~~35~~. The device of claim 1 ~~31~~ wherein each of said outer pair of said four photoconductive organic layers comprises a material selected from the group consisting of copper phthalocyanine, perylenetetracarboxylic dianhydride and 3,4,9,10-perylenetetracarboxylic-bis-benzimidazole.

36. The device of claim 23 wherein said two photoconductive organic layers is a pair of organic dyes selected to form a photovoltaic heterojunction and selected to have spectral sensitivity in a specified region of the electromagnetic spectrum.

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37. The device of claim 36 wherein said two transparent electrode layers are non-metallic conductive layers and further comprising a metallic layer disposed between each photoconductive organic dye layer and the adjacent transparent electrode layer.

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adjacent to first organic layer 603. A third organic layer 605, comprising, e.g., aluminum *tris*(8-hydroxyquinoline) (Alq_3), approximately 200-500 Å in thickness, is adjacent to second organic layer 604 to form a rectifying heterojunction at the second organic layer 604 / third organic layer 605 interface. A fourth organic layer 606, comprising, e.g., CuPc, PTCBI, or PTCDA, of approximate thickness 20-50 Å is adjacent to third organic layer 605. Finally, second transparent electrode 607 is adjacent to the third organic layer 605 and comprises, e.g., ITO of approximate thickness 1000-4000 Å, preferably less than 2000 Å and most preferably around 1000 Å. In this embodiment, an extra pair of organic materials, here second organic layer 604 and third organic layer 605, selected to have appropriate relative mobilities and HOMO-LUMO offset for exciton ionization and charge separation is placed within a "sandwich" of two other organic materials, here first organic layer 602 and fourth organic layer 606. In this instance, the "inner" pair of organic materials, 604 and 605, provides the exciton ionization and charge separation and the "outer" pair, 603 and 606, serves both as charge transporting layers, i.e., transporting the separated carriers to the proper electrodes for substantially ohmic extraction, and as protective cap layers, i.e., protecting the inner pair of organic layers from damage during deposition and use. The outer pair of organic materials may be from the group consisting of CuPc, PTCDA, and PTCBI, or any two of the three may be used. That is, the same material or any combination thereof may be used for both contacts. Note, however, in embodiment 600, the interior pair of layers, 604 and 605, are preferably deposited so that the cathode side is on top so as to incorporate a low resistance cathode. However, as with the exemplary embodiment of Fig. 4A, the order of the deposition of the inner pair of organic materials is not critical electronically, though the order of the inner pair determines the polarity of the photosensitive optoelectronic device . Since the outer pair of organic layers is relatively thin, their electronic properties are of much less significance here than in the bilayer exemplary embodiment described herein above wherein the CuPc, PTCDA, and PTCBI also performed photoconversion and exciton ionization in addition to transporting the separated carriers. Accordingly, an alternate embodiment of the present invention (not depicted) in a multilayer device would include the cathode on the bottom. The inner pair of organic materials may each be an organic dye chosen to have photosensitivity in a desired region of the spectrum. Since the Alq_3 / α-NPD pair is photosensitive in the ultraviolet (UV) part of the spectrum, multilayer device 600 with this

9. The device of claim 8 wherein said conductive oxide is indium tin oxide.

10. The device of claim 5 wherein said non-metallic conductive layer is a conductive polymer.

11. The device of claim 10 wherein said conductive polymer is polyanaline.

12. The device of claim 5 wherein at least one of said transparent electrode layers further comprises a metallic layer disposed between said non-metallic conductive layer and said at least one photoconductive organic layer.

13. The device of claim 2 wherein at least one of said transparent electrode layers is a low resistance non-metallic cathode.

14. The device of claim 13 wherein ~~said~~ A low resistance non-metallic cathode comprises indium tin oxide.

15. The device of claim 2 wherein at least one of said transparent electrode layers is a metallic/non-metallic composite cathode.

16. The device of claim 15 wherein said metallic/non-metallic cathode comprises indium tin oxide and magnesium silver.

17. The device of claim 12 wherein said metallic layer comprises a metal selected from the group consisting of gold, aluminum, magnesium, indium, and silver.

18. The device of claim 12 wherein said metallic layer is an alloy consisting essentially of magnesium and silver.

19. The device of claim 1 wherein said at least one photoconductive organic layer comprises an organic molecular crystal material.

20. The device of claim 19 wherein said organic molecular crystal material is selected from the group consisting of phthalocyanine compounds, perylene compounds, polyacene compounds, and porphyrin compounds.

21. The device of claim 1 wherein said at least one photoconductive organic layer comprises a polymeric material.

22. The device of claim 1 wherein said at least one photoconductive organic layer is one photoconductive organic layer.

23. The device of claim 1 wherein said at least one photoconductive organic layer is two photoconductive organic layers and said at least two electrode layers is two electrode layers.

24. The device of claim 23 wherein said two photoconductive organic layers are selected to form a photovoltaic heterojunction. A

25. The device of claim 24 wherein said two photoconductive organic layers are copper phthalocyanine and perylenetetracarboxylic dianhydride.

26. The device of claim 24 wherein said two photoconductive organic layers are copper phthalocyanine and 3,4,9,10-perylenetetracarboxylic-bis-benzimidazole.

27. The device of claim 25 wherein said transparent electrode layers comprise indium tin oxide.

28. The device of claim 26 wherein said transparent electrode layers comprise indium tin oxide.

SubA37 29. ~~The~~ device of claim 1 wherein said at least one photoconductive organic layer is four photoconductive organic layers, ~~having an~~ inner pair and an outer pair and said at least two transparent electrode layers is two transparent electrode layers.

38. The device of claim 2 further comprising a resistive load.

39. The device of claim 2 further comprising a power supply.

40. The device of claim 1 wherein the at least one photoconductive organic layer is a plurality of photoconductive organic layers selected to form a plurality of interfaces for dissociating excitons.

41. The device of claim 40 wherein the thicknesses of said plurality of photoconductive organic layers are selected to alter said molecular energy levels of excitons so as to form multiple quantum wells in said plurality of photoconductive organic layers.

42. The device of claim 40 wherein said plurality of photoconductive organic layers are selected from the group consisting of organic molecular crystal materials and polymeric materials.

43. The device of claim 40 wherein said plurality of photoconductive organic layers are selected from the group consisting of phthalocyanine compounds, perylene compounds, polyacene compounds, and porphyrin compounds.

44. The device of claim 40 wherein said plurality of photoconductive organic layers are selected from the group consisting of copper phthalocyanine, perylenetetracarboxylic dianhydride, 3,4,9,10-perylenetetracarboxylic-bis-benzimidazole, and vanadyl phthalocyanine.

45. The device of claim 2 wherein said substrate is a substantially flexible material.

46. The device of claim 2 wherein said substrate is a substantially rigid material.

47. The device of claim 2 wherein said substrate is a transparent material.

48. The device of claim 2 wherein said substrate is a substantially opaque material.

49. The device of claim 2 wherein said substrate is a substantially reflective material.

50. The device of claim 2 as a part of a multipixel photodetector.

51. A method of generating electrical power from ambient electromagnetic radiation comprising:

electrically attaching an organic photovoltaic device having at least two transparent electrode layers to a resistive load; and

exposing said device to electromagnetic radiation.

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52. A method of detecting electromagnetic radiation comprising:

electrically attaching an organic photodetector having at least two transparent electrode layers to a detecting circuit;

providing electrical power to said detecting circuit;

exposing said photodetector to ambient electromagnetic radiation; and

receiving electronic signals corresponding to said ambient electromagnetic radiation from said detecting circuit.

53. An electronic device incorporating the device of claim 1, said electronic device selected from the group consisting of a radio, a television, a computer, a calculator, a telephone, a wireless communication device, a watch, an emergency location device, an electric vehicle, an emergency power supply, a power generation device, a monitoring device, an inspection device, a radiation detector, an imaging device, and an optical coupling device.

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